

For QNDE '93

CHARACTERIZATION OF THE ELASTIC CONSTANTS OF UNIDIRECTIONAL LAMINATES BY OBLIQUE-INCIDENCE PULSED DATA

Ajit K. Mal and Shyh-Shiuh Lih
Mechanical, Aerospace and Nuclear Engineering Department
University of California Los Angeles, California

Yoseph Bar-Cohen
Jet Propulsion Laboratory
Pasadena, California

Abstract

Composite structural components may be subjected to a variety of defects resulting in a sharp reduction in their load carrying capacity or even catastrophic failure. It is extremely important to have the means to monitor the degradation suffered by critical components of a structure for safe operation during its service life. A nondestructive method based on ultrasonic experiment has recently been developed for the quantitative evaluation of composite structural components during service. The experimental part of the technique uses a two-transducer, pitch-catch type arrangement to generate a variety of elastic waves within the specimen immersed in water. The recorded reflection data are then analyzed by means of a theoretical model to back out the relevant properties. In this paper the method is applied to determine the stiffness constants of unidirectional laminate. A 3.45mm unidirectional composite specimen is used in the experiment. An error analysis is also carried out to investigate the validity of the technique. The procedure is shown to be efficient and sufficiently accurate so that it can be used for early detection of material degradation in composite structural elements during service.